UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION III
1650 Arch Street
Philadelphia, Pennsylvania 19103-2029

STATEMENT OF BASIS

FOR

U. S. EPA's UNDERGROUND INJECTION CONTROL (UIC) PROGRAM
DRAFT CLASS IID PERMIT NUMBER PAS2D218BWAR

FOR

Bear Lake Properties, LLC
3000 Village Run Road, Unit 103, #223
Wexford, Pennsylvania 15090

FOR

A project consisting of one Class II-D injection well, the Bittinger #3, for the disposal of fluids produced in association with oil and gas production operations. The proposed injection well will be located in:

Columbus Township
Warren County, Pennsylvania
Latitude 41° 59' 45.7" Longitude -79° 31' 41.0"

On March 24, 2015, Bear Lake Properties, LLC ("the Permittee") submitted a UIC permit application for the construction and operation of the above referenced Injection Well. On June 2, 2015, EPA sent a Notice of Deficiency (NOD) to Bear Lake Properties requesting additional information. In response to the June 2, 2015 EPA request, Bear Lake Properties supplemented the original application with additional information on October 7, 2015. Bear Lake Properties' March 24, 2015 and October 7, 2015 submittals are collectively referred to in this Statement of Basis as the "permit application." EPA has deemed the permit application complete.

Pursuant to the federal Safe Drinking Water Act, 42 U.S.C.§§ 300f *et seq*., and its implementing regulations, 40 CFR Parts 144-146, and § 147.1955, the EPA UIC Program is responsible for regulating, through the issuance of permits, the construction, operation, monitoring and closure of injection wells that place fluids underground for enhanced recovery of oil or natural gas or disposal. Today's draft permit specifies conditions for injection well construction, operation, monitoring, reporting, and plugging and abandonment which are specified so as to protect, and prevent the movement of fluids into, Underground Sources of Drinking Water (USDW). The Permittee's UIC project and the draft permit conditions specific to the project are described below:

Area of Review: Pursuant to the applicable regulations, 40 C.F.R. §§ 144.3 and 146.6(b), the "Area of Review" is an area surrounding the project or a well which the applicant must first research then develop a program for corrective action to address any wells which penetrate the injection zone and which may provide conduits for fluid migration. Bear Lake Properties chose a one-quarter mile fixed-radius as the Area of Review around the proposed injection well. To determine whether the one-quarter mile fixed radius was acceptable, EPA conducted a zone of endangering influence (ZEI) calculation using geologic information pertinent to the injection zone as well as anticipated operational parameters provided to EPA by Bear Lake Properties in its permit application. EPA determined, based on the ZEI calculation, that the one-quarter mile fixed radius Area of Review was acceptable. Bear Lake Properties provided information on the well population within the ZEI by conducting reviews of Pennsylvania Department of Environmental Protection Bureau of Oil and Gas well records and conducting a field survey of the area. Bear Lake Properties indicated in its permit application that no wells were found which penetrate the injection zone within this ZEI. The draft permit also requires Bear Lake Properties to perform corrective action on any unplugged/abandoned wells that penetrate the injection zone within the Area of Review if they are identified at a future date.

Underground Sources of Drinking Water (USDWs): A USDW is defined by the UIC regulations as an aquifer or its portion which, among other things, contains a sufficient quantity of ground water to supply a public water system and which also contains fewer than 10,000 mg/l (milligrams per liter) Total Dissolved Solids, and which is also not an exempted aquifer. The Permittee has identified the depth of the lowermost USDW, in the vicinity of the Injection Well, to be approximately 300 feet below surface elevation. The lowermost USDW at the site is within the Venango formation. The construction of the injection well, as provided in the permit application, was designed to meet the regulatory criteria of 40 CFR §§ 146.22 and 147.1955. This well has an 8 5/8 inch ground water protective string of casing (surface casing) running from the surface to approximately 405 feet which is cemented back to the surface. In addition, the permit application indicates that 4 1/2 inch long string casing was placed to a depth of 4508 feet and cemented back to a depth of 3343 feet as required by 40 C.F.R. § 147.1955(b)(5). Injection will occur through a 2 3/8 inch tubing string set on a packer installed above the injection perforations and located at a depth of approximately 4220 feet.

Injection and Confining Zones: Injection of fluids for disposal is limited by the permit to the Grimsby, Power Glen, and Whirlpool sandstone(s) of the Medina Group in the interval between approximately 4260 feet through 4439 feet (top of perforations at 4260 feet). This injection zone is separated from the lowermost USDW by an interval of approximately 3960 feet, while the confining zone, located above the injection zone between 3285 and 4260 feet, is comprised of approximately 800 feet of dolomite. In addition, gamma ray logging information from this well shows additional confining units of shale and or limestone between the lowermost USDW and the confining units adjacent to the injection zone.

Maximum Injection Pressure: The maximum allowable surface injection pressure for the permitted operation will be 1733 pounds/square inch (psi) and the maximum bottom-hole pressure will be 4074 psi. These maximum pressures were developed using a specific gravity for the injection fluid of 1.218 and an injection well depth of 4439 feet. Injection pressure as well as annular pressure will be continuously monitored. The maximum injection pressure has been calculated to prevent the initiation of new or the propagation of existing fractures in the injection

zone during operation of the Injection Well. EPA uses Instantaneous Shut-In Pressure (ISIP) as the basis for determining maximum injection pressure limitations. ISIP represents the minimum downhole injection pressure required to hold cracks in rock open. By setting the maximum injection pressure limit, USDW's are protected as required by the regulatory criteria of 40 CFR § 146.23(a).

Geologic and Seismic Review: The SDWA regulations for Class II wells do not require consideration of seismicity, unlike the SDWA regulations for Class I wells used for the injection of hazardous waste. See regulations for Class I hazardous waste injection wells at 40 C.F.R. §§ 146.62(b)(1) and 146.68(f). Nevertheless, EPA evaluated factors relevant to seismic activity such as the existence of any known faults and/or fractures and any history of, or potential for, seismic events in the area of the Injection Well as discussed below and addressed more fully in *"Region 3 framework for evaluating seismic potential associated with UIC Class II permits, September, 2013."* EPA also established a maximum injection pressure in the draft permit designed to limit the potential for seismic events.

The permit provides that the Permittee shall inject through the Injection Well only into a formation which is free of known open faults or fractures within the Area of Review as required in 40 C.F.R. § 146.22. The Permittee submitted geologic information that indicates the absence of faults in the confining and injection zone. Although this does not conclusively demonstrate the absence of any faults in the area of the well, the probability of injection induced seismicity is low because permit conditions require the operator to operate the well at a pressure low enough so any existing fractures will not be perpetuated.

Earthquake activity in Pennsylvania has been associated with the Precambrian, crystalline, igneous/metamorphic bedrock, sometimes referred to as "basement rock", which is located below sedimentary bedrock. Earthquakes in Pennsylvania are commonly related to either faulting in the basement rock, or to faulting at a shallower depth caused by tectonic stresses that originated from the basement rock. The available geophysical and seismic information researched by the Permittee, as well as through EPA's review of published information of seismicity in Pennsylvania (refer to information referenced below), shows no evidence of faults that reach the land's surface from basement rock.

The United States Geologic Survey (USGS) and the Pennsylvania Bureau of Topographic and Geologic Survey have not recorded any seismic activity that originated in Warren County, Pennsylvania. See "Earthquake Epicenters in Pennsylvania", Pennsylvania Department of Conservation and Natural Resources website; and "Earthquakes Hazards Program, Pennsylvania Seismicity Map 1973 to Present", United States Geological Survey website.

In addition, the National Academy of Sciences or National Research Counsel's report, "Induced Seismicity Potential in Energy Technologies", National Academy Press , 2013, indicates that oil and gas production in a reservoir can assist in preventing future impacts from seismicity due to injection because of the reduction in reservoir pore pressure during the years of gas production. Bear Lake Properties identified in the Permit Application significant gas production in the vicinity of the proposed Injection Well.

EPA developed the maximum injection pressure for the Injection Well using data submitted by Bear Lake Properties in the permit application. Bear Lake Properties provided to EPA fracture stimulation data obtained when the well was completed for gas production that included an instantaneous shut-in pressure (ISIP). The ISIP is the minimum pressure necessary to begin to reopen any fractures created during the fracture stimulation process and is significantly lower than the pressure required to fracture the rock. EPA limited in the draft permit the surface injection pressure and the bottom-hole injection pressure to a level lower than both the ISIP and the fracture pressure to prevent the initiation of new or the propagation of existing fractures.

Finally, a number of factors help to prevent injection wells from failing in a seismic event and contributing to the contamination of a USDW. Most deep injection wells, those that are classified as Class I or Class II injection wells, such as the Bear Lake Properties proposed Injection Well, are constructed to withstand significant amounts of pressure. The Bear Lake Properties Injection Well is constructed with multiple steel strings of casing that are cemented in place. Furthermore, the draft permit requires Bear Lake Properties to mechanically test the Injection Well to ensure integrity before operations begin and to continuously monitor the Injection Well during operations to detect any potential mechanical integrity concerns. The Injection Well will also be designed to automatically shut in and cease operation if a seismic event occurs that would affect the operation and/or mechanical integrity of the well. For the reasons above, the risk of seismic activity in Warren County as a result of the Bear Lake Properties Injection Well operation would be very low.

Injection fluid: The permit limits this well to the disposal of produced fluids associated with oil and gas production activities with an expected maximum volume of 30,000 barrels per month. This is a proposed commercial disposal well, and disposal sources will be from oil and gas production facilities. This includes produced and flowback water from wells completed in natural gas and oil producing formations. To ensure that injection into this well adheres to permit requirements, the permit requires Bear Lake Properties test the specific gravity of each truckload of fluid it receives for injection. Bear Lake Properties also must test for total dissolved solids, pH, total organic carbon (TOC), and other parameters as stated in Part II, paragraph C.4 of the draft permit at the initiation of injection and every two years thereafter, and whenever the operator anticipates a change in the injection fluid (e.g., from different geologic formations, geographic regions, different customers, etc.). The parameters chosen for sampling reflect not only some of the typical constituents found in the injection fluid, but also in shallow ground water. Should a ground water contamination incident occur during the operation of the Injection Well, EPA will be able to compare samples collected from ground water with the injection fluid analysis to help determine whether operation of the Injection Well may be the cause for the contamination.

Testing, Monitoring and Reporting Requirements: The Permittee is required to conduct a two part mechanical integrity test (MIT) after completing construction of the well. The two part MIT consists of a pressure test to make sure the casing, tubing and packer in the well do not leak and a fluid movement test to make sure that the movement of fluid does not occur outside the injection zone. In addition to the monitoring described above, additional pressure testing of the casing, tubing and packer will occur every two years or whenever a rework on the well requires the tubing and packer to be released and reset. The Permittee will be responsible for monitoring injection pressure, annular pressure, flow rate and cumulative volume on a continuous basis and

reporting this data to EPA on an annual basis. These tests as well as monitoring and cementing records, will provide documentation as to the absence of fluid movement into or between USDWs and flow conditions that exist in the injection zone during operation, thus assuring that USDWs are protected. Bear Lake has designated a network of five wells chosen to form a comprehensive monitoring network around the Injection Well. The purpose of these monitoring wells is to alert the Permittee of potential fluid movement in any direction. The wells designated to monitor Bittinger #3 are R. Trisket #1, R. Trisket #2, T. Reed #4, D. Wright #1, and R. Craker #1. In the event that in the future T. Reed #4 is converted from a monitoring well to a UIC-Permitted well, both the W.W. Hammond #1 and the T. Reed #2 wells will replace the T. Reed #4 as monitoring wells.

Plugging and Abandonment: The Permittee has submitted a plugging and abandonment plan that will result in an environmentally protective well closure at the time of cessation of operations. Prior to EPA making any authorization to inject, the Permittee will also make a demonstration of financial responsibility that assures adequate resources will be maintained for well closure. These provisions should preclude the possibility of abandonment without proper closure.

Expiration Date: Pursuant to 40 C.F.R. § 144.36, a final permit, when issued, will be in effect for ten years from the date of permit issuance. Also, pursuant to 40 C.F.R. § 146.36, EPA expects to review the permit at least once every five years to determine whether it should be modified, revoked and reissued, terminated or a minor modification made as provided in 40 C.F.R. §§ 144.39, 144.40 or 144.41. The proposed draft permit contains essentially the same conditions as the final permit will unless information is supplied to EPA which would warrant alternative conditions or actions on this permit application.

Additional Information: Questions, comments and requests for additional information may be directed to:

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The Administrative Record for this draft permit is available for public inspection during normal business hours at the offices of U.S. EPA Region III, at the address shown above. Links to online publications that compose the Administrative Record are also available via our online public notice located at the web address http://www.epa.gov/aboutepa/epa-pennsylvania. The Administrative Record for this action will remain open for public comment until Wednesday, March 16th, 2016.

A public hearing has been tentatively scheduled for Wednesday, March 16th at 7:00PM at the Columbus Volunteer Fire Department located at 4 West Main Street, Columbus, PA 16405. Requests to hold a public hearing must be received in writing by EPA by March 9, 2016. When requesting a public hearing, please state the nature of issues proposed to be raised. EPA

expressly reserves the right to cancel this hearing unless a significant degree of public interest, specific to these proposed UIC brine disposal injection operations, is evidenced by March 9, 2016.